EFFECTIVENESS OF VIRTUAL REALITY AND VIRTUAL REALITY WITH HOME BASED SELF INDUCED MOVEMENT THERAPY IN IMPROVING THE UPPER EXTREMITIES MOTOR RECOVERY AFTER STROKE

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The Dissertation entitled

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Dissertation Evaluated on _____

Internal Examiner **External Examiner**

CERTIFICATE I

This is to certify that the dissertation entitiled **"EFFECTIVENESS OF VIRTUAL REALITY AND VIRTUAL REALITY WITH HOME BASED SELF INDUCED MOVEMENT THERAPY IN IMPROVING THE UPPER EXTREMITIES MOTOR RECOVERY AFTER STROKE."**is a bonafide compiled work, carried out by **Register No: 271420202,** PPG College of Physiotherapy,Coimbatore-641035in partial fulfilment for the award of degree in Master of Physiotherapy as per the doctrines of requirements for the degree from **THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI-32.** This work was guided and supervised by **Prof. PRATHEEPA M.P.T (NUERO).,MIAP.**

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CERTIFICATE II

This is to certify that the dissertation **EFFECTIVENESS OF VIRTUAL REALITY AND VIRTUAL REALITY WITH HOME BASED SELF INDUCED MOVEMENT THERAPY IN IMPROVING THE UPPER EXTREMITIES MOTOR RECOVERY AFTER STROKE** was carried out by Reg.No. **271410207** P.P.G College of physiotherapy Coimbatore-35,affiliated to the TamilnaduDr.M.G.R. Medical university , Chennai-32, under my guidance and direct supervision.

Prof .M. PRATHEEPA MPT(NUERO)MIAP.

Guide

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ABSTRACT

Stroke is one of the commonest neurological emergencies. Stroke is the third most common cause of death in the developed world after cancer and ischemic heart disease and is responsible for a large proportion of physical disability becoming more frequent with increasing age. Stroke affects approximately 5, 00,000 new victims each year with the estimated number of stroke survivors close to 3 million. In India, there is some evidence that stroke is particularly common in young people. Every year more than 15 million world wide have a stroke. 5 million Die, 5 million recover and 5 million are disable. Mostly stroke occurs at the age of 35- 65years they can also occur in much younger people too.

OBJECTIVE

The aim of study was To find out the *effectiveness of visual reality and visual reality with home based self induced movement therapy in improving on upper extremities motor recovery after stroke*

DESIGN:

Tstudy was apre test and post test control group study.

PARTICIPANTS:

20 *subjects*, age 35 to 65 years each subject recived *visual reality and visual reality with home based self induced movement therapy for 2 months of period each subjects.*

OUT COME MESURE

The Upper Extremity Function Test (UEFT)

Fugal-Meyer Assessment Scale before and after treatment

RESULT

Statistical analysis done by using Mann-Whitney U test and Wilcox on-signed ranks test showed that there was significant improvements of upper extremities

CONCLUSION

There significant rise in stoke subjects recived *visual reality and visual reality with home based self induced movement therapy*

KEY WORD: *visual reality,Virtual environment,interactiveroom, with home based self induced movement therapy,lcd any time of monitor gaming instrument,joysticks.*

CHAPTER 1

INTRODUCTION

1.1BACKGROUND OF THE STUDY

Stroke is one of the commonest neurological emergencies. Stroke is the third most common cause of death in the developed world after cancer and ischemic heart disease and is responsible for a large proportion of physical disability becoming more frequent with increasing age. Stroke affects approximately 5, 00,000 new victims each year with the estimated number of stroke survivors close to 3 million. In India, there is some evidence that stroke is particularly common in young people. Every year more than 15 million world wide have a stroke. 5 million Die, 5 million recover and 5 million are disable. Mostly stroke occurs at the age of 35- 65years they can also occur in much younger people too.

Stroke is one of the important causes of severe disability in the society. The effects include paralysis of a limb or one side of the body and disturbances of speech and vision and including impairments of sensory, motor, mental, perceptual functions. It caused by embolism or fat deposition in artery which causes narrowing of lumen of the artery which result stroke, If stroke symptoms completely disappears less than 24 hours. This is called a mini stroke (Transient ischemic attack) TIA is a wearing sign that the

patient is in an high risk of stroke. If patient feels swallowing difficulty an dietitian is recommended. If patient has problem in speech an language or speech therapy is recommended. If has difficulty to walk or perform daily task an physiotherapist can offer exercise and home adaptation techniques .

Virtual reality or virtual realities (VR), which can be referred to as immersive multimedia or computer stimulated reality, replicates an environment that simulates a physical presence in places in the real world or an imagined world, allowing the user to interact in that world. Virtual realities artificially create sensory experiences, which can include sight, hearing, touch, and smell.

Most up-to-date virtual realities are displayed either on a computer screen or with special stereoscopic displays, and some stimulations include additional sensory information and focus on real sound through speakers or headphones targeted towards VR users. Some advanced haptic systems now include tactile information, generally known as *force feedback* in medical, gaming and military applications. Furthermore, virtual reality covers remote communication environments which provide virtual presence of users with the concepts of teleprocess and telexistence or a virtual artifact (VA) either through the use of standard input devices such as a keyboard and mouse, or through multimodal devices such as a weird glove or unidirectional. The simulated environment can be

similar to the real world in order to create a lifelike experience for example, in simulations for pilot or combat training or it can differ significantly from reality, such as in VR games.

What is home based self induced movement therapy

The focus of CIMT is to combine restraint of the unaffected limb and intensive use of the affected limb. Types of restraints include a sling or triangular bandage, a splint, a sling combined with a resting hand splint, a half glove, and a mitt. Determination of the type of restraint used for therapy depends on the required level of safety vs. intensity of therapy. Some restraints restrict the wearer from using their hand and wrist, though allow use of their non-involved upper extremity for protection by extension of their arm in case of loss of balance or falls. However, restraints that allow some use of the non-involved extremity will result in less intensive practice because the non-involved arm can still be used in complete tasks. Constraint typically consists of placing a mitt on the unaffected hand or a sling or splint on the unaffected arm, forcing the use of the affected limb with the goal of promoting purposeful movements when performing functional tasks. The use of the affected limb is called shaping. Typically, CIMT involves restraining the unaffected arm in patients with hemi paretic stroke.

1.2 NEED FOR STUDY

Study is done to prove the E*ffectiveness* of virtual reality and virtual reality with home based self induced movement therapy in improving on upper extremities motor recovery after stroke

To improve that visual reality therapy and home based self induced movement therapy is more effective

So the research works studying E*ffectiveness* of virtual reality and virtual reality with home based self induced movement therapy in improving on upper extremities motor recovery exercise are significant in the field of stroke rehabilitation

1.3AIM OF STUDY

To find out the *effectiveness of visual reality and visual reality with home based self induced movement therapy in improving on upper extremities motor recovery after stroke*

1.4 OBJECTIVES OF THE STUDY

Effectiveness of Visual reality

Whenever the patient sees a therapist he feels fear because of the treatment pain which he feels and thereby he gets psychologically stressed

But virtual reality therapy makes the patient psychologically happy and there by increases the effect of treatment

Effectiveness of virtual reality therapy with home based self induced movement therapy to improve the *upper extremities motor recovery after stroke*

Constrained home based self induced movement therapy is recommended for patient with upper limb dysfunction after stroke, yet evidence to support the implementation of constrained home based self induced movement in ambulatory care is insufficient

We assessed the efficiency of home *constrained home based self induced movement therapy, a modified form of Constrained home based self induced movement therapy that trains arm use in daily activities within the home environment.*

1.5HYPOTHESIS

Null Hypothesis

There was no statistically significant improvement in motor functions when treated *Effectiveness of virtual reality and virtual reality with home based self induced movement therapy in improving on upper extremities motor recovery after stroke are not yet been proved?*

Alternative Hypothesis

There was statistically significant improvement in motor functions when treated with Ef*fectiveness of visual reality and visual reality with home based self induced movement therapy in improving on upper extremities motor recovery after stroke*

CHAPTER -II

REVIEW OF LITERATURE

1. S=-0GIHFC aposnik G, Madman M, Bailey M, Thorpe KE, Hall J, and Cohen LG, et al. Effectiveness of Virtual Reality Exercises in Stroke Rehabilitation (EVREST): rationale, design, and protocol of a pilot randomized clinical trial assessing the Wiki gaming system. Into J Stroke. 2010; 5:47–51.

2. Nakayama H, Jorgensen HS, Rancho HO, Olsen TS. Recovery of upper extremity function in stroke patients: the Copenhagen Stroke Study. Arch Phys Med Rehabil.1994; 75:394–398.

3. Barzel A et al. Home-based constraint-induced movement therapy for patients with upper limb dysfunction after stroke (HOMECIMT): A cluster-randomized, controlled trial. Lancet Neural 2015 Sep; 14:893.

4 Laver K, George S, Thomas S, Deutsch JE, Clotty M. Virtual reality for stroke rehabilitation. Stroke. 2012; 43:e20–e21.

5. Saposnik G, Teasel R, Madman M, Hall J, McElroy W, Cheung D, et al. Effectiveness of virtual reality using Wiki gaming technology in stroke rehabilitation: a pilot randomized clinical trial and proof of principle. Stroke. 2010; 41:1477–1484.

6. A. Kushner, “Virtual reality and physical rehabilitation: a new toy or a new research and rehabilitation tool?” Journal of NeuroEngineering and Rehabilitation, vol. 1, article 8, 2004.

7. Henderson A, Korner-Bitensky N, Levin M. Virtual reality in stroke rehabilitation: a systematic review of its effectiveness for upper limb motor recovery. Top Stroke Rehabil.2007; 14:52–61.

8. Elder RS, Accurate G, Savage R, Savage S, Sucar LE, Reinkensmeyer D, et al. Nintendo Wii remote for computer simulated arm and wrist therapy in stroke survivors with upper extremity hemiparesis; Proceedings of the Virtual Rehabilitation Conference; 2008 Aug 25-27; Vancouver, Canada. p. 74.

9. Moonward MR, Dust CG, Max MD, McNulty PA. Wiki-based movement therapy to promote improved upper extremity function post-stroke: a pilot study. J Retail Med.2011;43:527–533.

10. Turkmens HL, Robbers GM, Streur-Kranenburg MF, Stem HJ, van den. Energy expenditure in chronic stroke patients playing Wiki Sports: a pilot study. J Neuron Rehabil.2011;8:38

11. Isbel, Stephen; Chaperon, Christine; McConnell, David; and Ranke, Judy (2014) "Home-based Constraint Induced Movement Therapy Post stroke," *The Open Journal of physiotherapy* : Vol. 2: Is. 4, Article 3.

CHAPTER III

METHODOLOGY

3.1Study Design:

Experimental design with pre and posttest - two comparison treatments

Study Setting:

The study was conducted in PPG college of physiotherapy, and ASHWIN Hospital, Coimbatore under the supervision of concerned authority.

3.2Sample Size:

Sample consisted of 20 stroke patient who were satisfying the inclusion criteria and referred to the physiotherapy department.

3.3Sampling Method:

Non probability convenient sampling technique was used for selecting sample from the population. 20 stroke patient selected by non probability convenient sampling was randomly assigned into control and experimental groups of 10 each.

3.4SELECTION CRITERIA

Inclusion criteria

- Age ≥ 35 and < 65 years old;
- Sex both males and females.
- Ischemic or hemorrhagic stroke (does not have to be a first time STORKE)
- Mild to moderate upper limb impairment (score 3-6 Cherokee-McMaster arm component or ability to perform VR tasks at least at the lowest setting according to clinician);
- At least 6 months post stroke;
- Absence of severe cognitive impairment as defined by Mini-mental state examination
- (Holstein et al, 1975) cut-off > 23; 4) able to follow instructions as defined by Mississippi Aphasia Screening
- Test (Romero et al, 2012) ≥ 45; 5)
- Able to move the joints (proximal and distal) as defined by Medical Research
- Council Scale for Muscle (Paternostro-Sluga et al, 2008) ≥ 2
- No increase or slightly increase in muscle
- Tone as defined by Modified Ashworth Scale

Exclusion Criteria:

- Being medically unstable;
- Severe cognitive or communication deficits;
- Visual impairments;
- Severe balance deficits limiting sitting safely independently;
- Shoulder pain;
- Previous upper limb impairment limiting potential recovery.
- individuals with ataxia or any other cerebella symptom;
- orthopedic alterations or pain syndrome of the upper limb;
- peripheral nerve damage affecting the upper extremities;
- individuals whose visual or hearing impairment does not allow
- Possibility of interaction with the system.

3.5 STUDY DURATION:

Total duration of the study was four months. Data collected in a period of 2 months. (Intervention for 8 weeks)

3.6Materials:

- Fugal-Meyer Assessment Scale
- Home based materials
- Upper Extremity Function Test (UFT)
- LCD or any time of monitors
- An gaming instrument like Xbox, play stations etc.. Which support joysticks

TOOLS NEEDED FOR VIRTUAL REALITY

- LCD or LED monitors
- Virtual reality glasses or goggles
- Data gloves
- Joysticks
- Virtual reality headphones
- Play station or Xbox etc….

3.6 Parameter:

Fugal-Meyer Assessment Scale

Items are scored on a 3-point ordinal scale

0 = cannot perform

1 = performs partially

2 = performs fully

Maximum Score = 226 points

The Five domains assessed include:

Motor function (UE maximum score = 66;LE maximum score = 34)

Sensory function (maximum score = 24)

Balance (maximum score = 14)

Joint range of motion (maximum score = 44)

Joint pain (maximum score = 44)

Subscales can be administered without the using the full test

Time duration 06 to 30 Minutes

The Fugal-Meyer Assessment Scale Test requires:

1. Tennis ball
2. A small spherical shaped container
3. A tool to administer reflex tests
4. Enough space is needed for a patient to move around freely
5. If possible, space sh ould be a quiet, private room with few distractions

The Upper Extremity Function Test (UEFT)

The Upper Extremity Function Test (UEFT) is an evaluative measure to assess upper extremity functional impairment and the severity of impairment in patients exhibiting dysfunction in the upper extremity.

Score

- 3- Performs test normally

- 2- Completes test, but takes abnormally long time or has great difficulty

- 1- Performs test partially. This grade is assigned when the patient is able to pick up or lift the test item from the table but is unable to place the object in its correct end position. For example, in items 27 to 29, the patient is able to lift the pitcher or glass but is unable to our the water into the proper receptacle

  0- Can perform no part of the test. If the patient pushes objects out of their slots or around on the table a grade of 0 is assigned

The total score is tallied. The maximum score for the dominant hand is 99 as compared to a maximum score of 96 for the non-dominant hand, because item 33 consists of writing of the patient's name with the dominant hand.

3.7 Procedure:

The study was designed as pre test-post test experimental-control group study design. 20 patients with stoke satisfying inclusion criteria were selected by non-probability convenient sampling method. These patients were randomly assigned to control and experimental group of 10 each. The control group received visual reality with conventional physical therapy treatment including active and passive movements to lower limbs, passive stretching, strengthening exercises, weight bearing exercises, and gait training. Experimental group received visual reality

therapy with home based self induced movement therapy in addition to conventional physical therapy treatment.

Pre-test evaluation was done on the first day before commencing the treatment program. Post-test evaluation was done, on the last day, after sixteen weeks treatment program. Outcomes were measured using Fugal-Meyer Assessment Scale

3.8 SUGGESTIONS

1. Further study can be conducted with more sample size.
2. Further studies can be done in other different type of STOKE and with various severities of STOKE.
3. Further studies are recommended with a longer duration of treatment program
4. Long term follow up is needed to evaluate the differences in the condition of the patients from the current status.
5. Further study is needed to systematically determine the most efficacious protocol for the patient.
6. Further study is suggested with more specific STOKE conditions.
7. Randomized studies are needed to establish whether Exercise effect of visual reality and home based self induced movement therapy improves upper motor functions in stoke patient.

8. Further studies should be undertaken with the similar patient group to confirm the findings of the study

Passive stretching

- To the biceps,triceps ,forarm muscles.
- Each stretch should be five times during session of exercises, it should be held up to 20 seconds.
- Strengthening exercises
- Shoulders
- Arm and forearm muscles

Weight bearing exercises

- Single upper limp standing
- Weigh shift to right and left

3.9 Statistical Tool:

The data were statistically analyzed using following tests

Mann – Whitney U Test

This is used for testing the equality of means of two populations when the populations are not normal.

Let x1, x2 . . . . . an be the sample from first population and y1, y2, ... yen be the sample from the second population. Combine the two samples and then give ranks to the observations starting from one onwards.

The test statistic is

$$U = S – n(n +1) 2 15$$

Where,

n = number of sample observation from first population

S = sum of the ranks assigned to the sample observation from first population (i.e. x values)

The significance of the value of the u statistic is given by packages.

This is the alternative to two simplest‟ test when the samples are not coming from normal populations.

Wilcox on-Signed Ranks Test

This is used for testing the equality of means of two populations which are not normal and is the case of dependent sampling.

Let x1, x2, ...xn be the sample from first population,y1,y2, ... yn be the sample from second population. Calculate di = xi – yi,

i.e. difference between x and y values Rank the di values without considering their signs.

Now assign the sign of each di value to the rank.

Let T+ = Sum of the ranks with positive sign,

T= Sum of the ranks with negative sign

The test statistic used is

T = Min (T+, T-)

The significance of the value of T obtained is given by packages.

This is the alternative of paired‟ test when samples are not from normal populations.

CHAPTER IV

DATA ANALYSIS AND RESULT

Significant at < 0.01 level

In the statistical analysis of pre and post FUGL-MEYER ASSESSMENT SCALE scores of control group, the mean value of FMS scores of pre test data was 71.27 and that of post test data was 79.99. Z value obtained was -3.408 which is statistically significant at <0.01 level. The post test was significantly different from the pre- test scores.

Data analysis shows significant improvement in gross motor functions of control group. This might be due to the cumulative (increasing) effect of conventional physiotherapy.

Table I

Statistical analysis of pre and post FMS scores of control group using Wilcox on-Signed Ranks Test

	N	MEAN	MEAN RANK		SUM OF RANK T		Z
PRE	10	2.77	POSITIVE	NEGATIVE	POSITIVE	NEGATIVE	
POST	10	3.33	0.00	8.00	0.00	120.00	-3.609

Table II

Statistical analysis of pre and post UFA scores of control group using Wilcox on-Signed Ranks Test

	N	MEAN	MEAN RANK		SUM OF RANK T		Z
PRE		2.77	POSITIVE	NEGATIVE	POSITIVE	NEGATIVE	
POST		3.33	0.00	8.00	0.00	120.00	3.609

*Significant at < 0.01 level in the statistical analysis of pre and post UFA scores of control group, the mean value of UFS scores of pre test data was 2.77 and that of post test data was 3.33. Z value obtained was -3.690 which is statistically significant at <0.01 level. The post test was significantly different from the pre- test scores.

Data analysis shows significant improvement in motor functions of control group. This might be due to the cumulative effect of visual reality and home based self induced movement therapy conventional physiotherapy.

Table III

Statistical analysis of pre and post FMS scores of experimental group using Wilcox on-Signed Ranks Test

	N	RANK	MEANS RANK		SOME OF RAMK(T)		Z
PRE	10	71.52	POSITIVE	NEGATIVE	POSITIVE	NEGATIVE	-3.408
POST	10	90.86	0.00	8.00	0.00	120.0	

*Significant at < 0.01 level In the statistical analysis of pre and post FMS scores of experimental group, the mean value of FMS scores of pre test data was 71.52 and that of post test data was 90.86. Z value obtained was -3.408 which is statistically significant at <0.01 level. The post test was significantly different from the pre- test scores.

Data analysis shows significant improvement in upper limp *motor* functions of experimental group. This might be due to the cumulative effect of conventional physiotherapy and visuval reality and home based self induced movement therapy.

Table IV

Statistical analysis of pre and post UFA scores of experimental group using Wilcox on-Signed Ranks Test

	N	MEAN	MEAN RANK		SUM OF RANK (T)		Z
PRE	15	2.8	NEGATIVE	POSITIVE	NEGATIVE	POSITIVE	
POST	15	4.93	0.00	8.00	0.00	120.0	-3.449

Significant at < 0.01 level In the statistical analysis of pre and post UFA scores of experimental group, the mean value of UFA scores of pre test data was 2.8 and that of post test data was 4.93. Z value obtained was -3.449 which is statistically significant at <0.01 level. The post test was significantly different from the pre- test scores.

Data analysis shows significant improvement in gross motor functions of experimental group. This might be due to the cumulative effect of conventional physiotherapy and visuval reality and self induced movement therapy

Table V

Comparison of post FMS scores of control and experimental group using Mann-Whitney U Test

	GROUP	N	MEAN RANK	SUM RANK (T)	MANN WHITNEY	Z
GMFM	Control	15	8.00	120.00	.000	-4.667
POST	Exp	15	23.00	345.00		

Significant at < 0.01 level For the control group, the mean rank was 8.00 and sum of ranks was 120.00. For the experimental group, the mean rank was 23.00 and sum of ranks was 345.00. Z value obtained was -4.667, which is statistically significant at <0.01 level.

The data analysis shows significant improvement in upper limp motor function in experimental group over the control group. This might be due to the effect of visual reality and home based self induced movement therapy improving upper motor functions in stoke patient.

Table VI

Comparison of post UFA scores of control and experimental 0group using Mann-Whitney U Test

	GROUP	N	MEAN RANK	SUM OF RANK (T)	MANN WHITNEY	Z
IRM STS	CONTROL	15	9.57	143.50	23.500	-3.727
POST	EXPERI	15	21.43	321.50		

Significant at < 0.01 level For the control group, the mean rank was 9.57 and sum of ranks was 143.50. For the experimental group, the mean rank was 21.43 and sum of ranks was 321.50. Z value obtained was -3.727, which is statistically significant at <0.01 level.

The data analysis shows significant improvement in upper motor function in experimental group over the control group. This might be due to the effect of home based self induced movement therapy. Visual reality and home based self induced movement therapy more effective in improving upper motor functions in stoke patient.

RESULT

Corresponding to the aims and objectives, the results of the present study are

Virtual reality and home based self induced movement therapy when given along with conventional physiotherapy showed statistically significant improvement in upper motor functions in stoke patient control group.

Virtual reality and home based self induced movement therapy more effective in improving upper motor functions in stoke patient.

CHAPTER V

DISCUSSION

This study was an experimental comparative approach to find out effectiveness of visual reality and home based self induced movement therapy more effective in improving upper motor functions in stoke patient.

The individuals selected for the study was 20 patients with stoke. The subjects were divided in to two groups – control group and experimental groups each consisting of 10 subjects. The age group of the subjects was similar in both groups. The control group received 45 mints visual reality 20 minutes of conventional physiotherapy which consisted of passive and active movements, passive stretching, strengthening exercises, weight bearing exercises and gait training for 12 weeks. The experimental group received 45-45 minutes of Loaded on alternative days in addition to conventional physiotherapy. Both groups were assessed on the first day before the treatment session and on the last day after the treatment session. The outcome measurements used are Fugal-Meyer Assessment Scale Upper limp functional assessment.

Mean pretest score of FMS for control group was 71.27 and for experimental group was 71.52; and the mean pretest score of UFA for control group was 2.77 and for experimental group was 2.8. After 4

week treatment programs the mean post-test score of FMS for control group was 79.99 and for experimental group was 90.86; and the mean post-test score of UFA for control group was 3.33 and for experimental group were 4.93. Wilcox on-Signed Ranks Test and Mann Whitney U Test were the main statistical tests used to analyze the data to reach the conclusion that there is significant improvement in both groups

The analysis of FMS showed significant improvement in upper motor functions in the experimental group than the control group. The significant improvement in the control group may be due to the effect of conventional physiotherapy. The significant improvement in the experimental group may be due to the cumulative effect of visual reality and home based self induced movement therapy.

Mean pretest score of FMS for control group was 71.27 and for experimental group was 71.52; and the mean pretest score of UFA for control group was 2.77 and for experimental group was 2.8. After 4 week treatment programs the mean post-test score of FMS for control group was 79.99 and for experimental group was 90.86; and the mean post-test score of UFA for control group was 3.33 and for experimental group were 4.93. Wilcox on-Signed Ranks Test and Mann Whitney U Test were the main statistical tests used to analyze the data to reach the conclusion that there is significant improvement in both groups

The analysis of FMS showed significant improvement in upper motor functions in the experimental group than the control group. The significant improvement in the control group may be due to the effect of conventional physiotherapy. The significant improvement in the experimental group may be due to the cumulative effect of visual reality and home based self induced movement therapy.

It might be the stretching which helped to prevent contractures, is one of the reasons for the improvement in gross motor functions. During passive stretch, both the longitudinal and lateral force transduction occurs in the connective tissue, and tension rises sharply. After a particular point, there is a mechanical disruption of cross bridges as the filaments slides apart, leading to abrupt lengthening of sarcomeres. When the stretch force is released, the individual sarcomeres return to their resting length. If more permanent length increases are to occur, the stretch force must be maintained over an extended period of time. Neurophysiologic ally, when a muscle is stretched, the primary afferent fibers stimulate the alpha motor neurons in the spinal cord and facilitate contraction of the extramural fibers, increasing tension in a muscle. If a slow stretch force is applied to the muscle, the Golgi tendon organ fires and inhibits the tension in the muscle, allowing parallel elastic component of the muscle to remain relaxed and lengthen

Weight bearing (closed kinematic chain) exercises stimulates muscular contractions, joint approximation, joint congruency, and

thereby providing dynamic stabilization and postural holding around the joint. Stability is enhanced by weight bearing position. CKC (closed kinematic chain) activities are provided by stimulation of the proprioceptive system. Weight bearing exercise stimulates type I and type III joint receptors to generate a signal. Type I receptors will respond when joint pressure is applied to the joint surfaces. Type III receptors detect rapid joint movement, and respond to deep pressure, perpendicular compression of the joint capsule as performed in a weight bearing posture and vibration. In a CKC movement, indirect forces from muscles of adjacent segments are transferred to and received from adjoining segments. So improved motor function might be due to increased proprioceptive function

The preference of virtual reality exposure therapy over in-vivo exposure therapy is often debated, but there are many obvious advantages of virtual reality exposure therapy that make it more desirable. For example, the proximity between the client and therapist can cause problems when in-vivo therapy is used and transportation is not reliable for the client or it is impractical for them to travel as far as needed. However, virtual reality exposure therapy can be done from anywhere in the world if given the necessary tools. Going along with the idea of unavailable transportation and proximity, there are many individuals who require therapy but due to various forms of immobilizations (penalization, extreme obesity, etc..) they cannot

physically be moved to where the therapy is conducted. Again, because virtual reality exposure therapy can be conducted anywhere in the world, those with mobility issues will no longer be discriminated against. Another major advantage is fewer ethical concerns than in-vivo exposure therapy. Once again, considering the idea of close proximity no longer being a requirement, this decreases the chances of inappropriate client-therapist relations taking place

EFFECT OF VISUAL REALITY FOR STROKE PATIENT

The preference of virtual reality exposure therapy over in-vivo exposure therapy is often debated, but there are many obvious advantages of virtual reality exposure therapy that make it more desirable. For example, the proximity between the client and therapist can cause problems when in-vivo therapy is used and transportation is not reliable for the client or it is impractical for them to travel as far as needed. However, virtual reality exposure therapy can be done from anywhere in the world if given the necessary tools. Going along with the idea of unavailable transportation and proximity, there are many individuals who require therapy but due to various forms of immobilizations (penalization, extreme obesity, etc..) they cannot physically be moved to where the therapy is conducted. Again, because virtual reality exposure therapy can be conducted anywhere in the world, those with mobility issues will no longer be discriminated against. Another major advantage is fewer ethical

concerns than in-vivo exposure therapy. Once again, considering the idea of close proximity no longer being a requirement, this decreases the chances of inappropriate client-therapist relations taking place

Effect of home induced movement therapy for stroke

Patient

Stroke patients usually use unaffected arm to do their daily activity as they feel difficulty to use the effected arm

By tying their unaffected arm we force them to use their effected arm to do their daily activity this helps them to recover their effected arm quicker

CHAPTER VI

SUMMARY AND CONCLUSION

SUMMARY:

The study was conducted to investigate the effectiveness of visual reality and home based self induced movement therapy in improving upper motor functions in stoke patient along with conventional physiotherapy

CONCLUSION:

The study proves *Effectiveness of visual reality and visual reality with home based self induced movement therapy* along with conventional physiotherapy is more effective than the conventional physical therapy alone in improving motor functions of upper limb in stroke patients. This helps the patient improve their quality of life by improving motor functions of upper limb.

Hence taking into account of the positive results of the study it can be concluded that the E*ffectiveness of visual reality and visual reality with home based self induced movement therapy can* be introduced as a safe and cost Effective treatment in improving motor functions of upper limb in stroke patients

CHAPTER VII

LIMITATIONS AND SUGGESTIONS

LIMITATIONS

1. Time allotted for data collection was 3 months.

2. Sample size was small, which reduces the generalisability.

3. Duration of treatment program was only 16 weeks, but the ideal time for the treatment program is 4 weeks.

4. Only stroke patients and diagnosis participated in the study.

5. The study assessed only short term progress of the patient. Long term follow up is needed to evaluate the differences in the condition of the patients from current status.

6. No follow ups could be done to determine whether the effect was maintained.

SUGGESTIONS

1. Further study can be conducted with more sample size.

2. Further studies can be done in other different type of STOKE and with various severities of STOKE.

3. Further studies are recommended with a longer duration of treatment program

4. Long term follow up is needed to evaluate the differences in the condition of the patients from the current status.

5. Further study is needed to systematically determine the most efficacious protocol for the patient.

6. Further study is suggested with more specific STOKE conditions.

7. Randomized studies are needed to establish whether Exercise effect of visual reality and home based self induced movement therapy improves upper motor functions in stoke patient.

8. Further studies should be undertaken with the similar patient group to confirm the findings of the study

CHAPTER VIII

REFERENCES

1. Nichols-Larsen DS, Clark PC, Zeringue A, Greenspan A, Blanton S. Factors influencing stroke survivors' quality of life during subacute recovery. *Stroke.*2005; 36: 1480–1484.
2. Langhorne P, Coupar F, Pollock A. Motor recovery after stroke: a systematic review. *Lancet Neurol.* 2009; 8: 741–754.
3. Barreca S, Wolf SL, Fasoli S, Bohannon R. Treatment interventions for the paretic upper limb of stroke survivors: a critical review. *Neurorehabil Neural Repair.* 2003; 17: 220–226.
4. Wolf SL, Winstein CJ, Miller JP, Taub E, Uswatte G, Morris D, Giuliani C, Light KE, Nichols-Larsen D. Effect of constraint-induced movement therapy on upper extremity function 3 to 9 months after stroke: the EXCITE randomized clinical trial. *J Am Med Assoc.* 2006; 296: 2095–2104.
5. Jutai JW, Teasell RW. The necessity and limitations of evidence-based practice in stroke rehabilitation. *Top Stroke Rehabil.* 2003; 10: 71–78.
6. Teasell R, Meyer MJ, McClure A, Pan C, Murie-Fernandez M, Foley N, Salter K. Stroke rehabilitation: an international perspective. *Top Stroke Rehabil.*2009; 16: 44–56.

7. Kwakkel G, Wagenaar RC, Koelman TW, Lankhorst GJ, Koetsier JC. Effects of intensity of rehabilitation after stroke. A research synthesis. *Stroke.* 1997; 28:1550–1556.
8. Luft AR, McCombe-Waller S, Whitall J, Forrester LW, Macko R, Sorkin JD, Schulz JB, Goldberg AP, Hanley DF. Repetitive bilateral arm training and motor cortex activation in chronic stroke: a randomized controlled trial. *J Am Med Assoc.* 2004; 292: 1853–1861.
9. Buccino G, Solodkin A, Small SL. Functions of the mirror neuron system: implications for neurorehabilitation. *Cogn Behav Neurol.* 2006; 19: 55–63.
1. Celnik P, Stefan K, Hummel F, Duque J, Classen J, Cohen LG. Encoding a motor memory in the older adult by action observation. *Neuroimage.* 2006;29: 677–684.
10. Rizzolatti G, Fabbri-Destro M. The mirror system and its role in social cognition. *Curr Opin Neurobiol.* 2008; 18: 179–184.
11. Celnik P, Webster B, Glasser DM, Cohen LG. Effects of action observation on physical training after stroke. *Stroke.* 2008; 39: 1814–1820.
12. Crosbie JH, Lennon S, Basford JR, McDonough SM. Virtual reality in stroke rehabilitation: still more virtual than real. *Disabil Rehabil.* 2007; 29: 1139–1146;discussion 1147–1152.

13. Lucca LF. Virtual reality and motor rehabilitation of the upper limb after stroke: a generation of progress? *J Rehabil Med.* 2009; 41: 1003–1100.
14. Gowland C, Stratford P, Ward M, Moreland J, Torresin W, Van Hullenaar S, Sanford J, Barreca S, Vanspall B, Plews N. Measuring physical impairment and disability with the chedoke-mcmaster stroke assessment. *Stroke.* 1993; 24:58–63.
15. Cote R, Battista RN, Wolfson C, Boucher J, Adam J, Hachinski V. The Canadian Neurological Scale: validation and reliability assessment. *Neurology.*1989; 39: 638–643.
16. Bushnell CD, Johnston DC, Goldstein LB. Retrospective assessment of initial stroke severity: comparison of the NIH stroke scale and the Canadian Neurological Scale. *Stroke.* 2001; 32: 656–660.
17. Wolf SL, Lecraw DE, Barton LA, Jann BB. Forced use of hemiplegic upper extremities to reverse the effect of learned nonuse among chronic stroke and head-injured patients. *Exp Neurol.* 1989; 104: 125–132.
18. Carey JR, Kimberley TJ, Lewis SM, Auerbach EJ, Dorsey L, Rundquist P, Ugurbil K. Analysis of fmri and finger tracking training in subjects with chronic stroke. *Brain.* 2002; 125: 773–788.
19. Duncan PW, Wallace D, Lai SM, Johnson D, Embretson S, Laster LJ. The stroke impact scale version 2.0. Evaluation of reliability, validity, and sensitivity to change. *Stroke.* 1999; 30: 2131–2140.

20. Saposnik G, Mamdani M, Bayley M, Thorpe KE, Hall J, Cohen LG, Teasell R. Effectiveness of Virtual Reality Exercises in Stroke Rehabilitation (EVREST): rationale, design, protocol and baseline data of a pilot randomized clinical trial assessing the Wii gaming system. *Int J Stroke.* 2010; 5: 47–51.
21. Fisher RS, Harding G, Erba G, Barkley GL, Wilkins A. Photic- and pattern-induced seizures: a review for the Epilepsy Foundation of America Working Group. *Epilepsia.* 2005; 46: 1426–1441.
22. Bonis J. Acute Wiiitis. *N Engl J Med.* 2007; 356: 2431–2432.
23. Borg G. Perceived exertion as an indicator of somatic stress. *Scand J Rehabil Med.* 1970; 2: 92–98.
24. Mathiowetz V, Volland G, Kashman N, Weber K. Adult norms for the Box and Block Test of manual dexterity. *Am J Occup Ther.* 1985; 39: 386–391.
25. Dobkin BH. Training and exercise to drive poststroke recovery. *Nat Clin Pract Neurol.* 2008; 4: 76–85.
26. Barak S, Duncan PW. Issues in selecting outcome measures to assess functional recovery after stroke. *NeuroRx.* 2006; 3: 505–524.
27. Lin KC, Hsieh YW, Wu CY, Chen CL, Jang Y, Liu JS. Minimal detectable change and clinically important difference of the Wolf Motor Function Test in stroke patients. *Neurorehabil Neural Repair.* 2009; 23: 429–434.

28. Langhammer B, Stanghelle JK. Bobath or motor relearning programme? A comparison of two different approaches of physiotherapy in stroke rehabilitation: a randomized controlled study. *Clin Rehabil.* 2000; 14: 361–369.
29. Logigian MK, Samuels MA, Falconer J, Zagar R. Clinical exercise trial for stroke patients. *Arch Phys Med Rehabil.* 1983; 64: 364–367.
30. Lord JP, Hall K. Neuromuscular reeducation versus traditional programs for stroke rehabilitation. *Arch Phys Med Rehabil.* 1986; 67: 88–91.
31. van Vliet PM, Lincoln NB, Foxall A. Comparison of bobath based and movement science based treatment for stroke: a randomised controlled trial. *J Neurol Neurosurg Psychiatry.* 2005; 76: 503–508.
32. Kim JH, Jang SH, Kim CS, Jung JH, You JH. Use of virtual reality to enhance balance and ambulation in chronic stroke: a double-blind, randomized controlled study. *Am J Phys Med Rehabil.* 2009; 88: 693–701.
33. Cirstea MC, Levin MF. Compensatory strategies for reaching in stroke.*Brain.* 2000; 123: 940–953.

ANNEXURE – I

INFORMED CONSENT OF THE SUBJECT

I, _____ hereby agree to provide my fullest consent and co- operation as a subject for the research work of Reg.No :271420202 entitled **"**EFFECTIVENESS OF VIRTUAL REALITY AND VIRTUAL REALITY WITH HOME BASED SELF INDUCED MOVEMENT THERAPY IN IMPROVING THE UPPER EXTREMITIES MOTOR RECOVERY AFTER STROKE". The possible benefits and risk of the study as well as the procedure and duration of the study have been explained to me. The questions and queries I have posed have been answered to my satisfaction and I am aware that my identity will be kept confidential. I am also aware that I can discontinue the study at anytime if I wish to do so.

Date

Place

Signature of the subject

Signature of the Principal Investigator

ANNEXTURE – I I

ETHICAL CLEARANCE CERTIFICATE

We hereby declare that the research titled, **"EFFECTIVENESS OF VIRTUAL REALITY AND VIRTUAL REALITY WITH HOME BASED SELF INDUCED MOVEMENT THERAPY IN IMPROVING THE UPPER EXTREMITIES MOTOR RECOVERY AFTER STROKE."** carried out by **Reg.No :271420202of 2nd year MPT** has been brought forward forscrutiny to the board members. After analyzing the objectives, subjects involved and themethodology of the project, the following conclusions were drown. The study does not cause any mental or physical harm to the subjects involved and there are no risks involved in the study. The performance of the study procedure will not cause any injury to the subjects. The board has evaluated and confirmed that the experimenter is trained and qualified. The informed consent form ensures that the experimenter explains the procedure of the study to the subjects, their voluntary participation is confirmed and the identification of the subjects is maintained N confidentially. More over the findings of the study will benefit similar subjects, the profession and the society. Hence the review board has no objections on the conduct of the study.

Chairman of Institutional Review